

## CLAIMS

1           1.     A interconnecting unit for electrically coupling a microelectronic die  
2     having an integrated circuit to voltage sources and signal sources, the interconnecting unit  
3     comprising:

4                 a substrate having a cap-zone defined by an area that is to be encapsulated by a  
5     protective casing, a plurality of interconnects having a plurality of first elements in the cap-  
6     zone, a plurality of second elements arranged in an array outside of the cap-zone, and a  
7     plurality of transmission lines coupling the first elements to the second elements; and

8                 a gasket attached to the substrate outside of the cap-zone, wherein at least a  
9     portion of the gasket is adjacent to at least a portion of the cap-zone.

1           2.     The interconnecting unit of claim 1 wherein:

2                 the substrate has a die-side to which the die is to be attached and the cap-zone  
3     is on the die-side surrounding the contact array; and

4                 the gasket is a thin film disposed on the die-side of the substrate such that the  
5     thin film surrounds the cap-zone.

1           3.     The interconnecting unit of claim 2 wherein the thin film is a pliable  
2     tape applied to the substrate.

1           4.     The interconnecting unit of claim 2 wherein the thin film is a polymeric  
2     film deposited on the substrate.

1           5.     The interconnecting unit of claim 1 wherein:

2                 the substrate has a slot, a die-side to which the die is to be attached, and a wire-  
3     side opposite the die-side;

4                 the first elements of the interconnects comprise a plurality of contact elements  
5     being arranged in a contact array adjacent to the slot on the wire-side of the substrate such

6 that the cap-zone surrounds the contact array and the slot on the wire-side of the substrate,  
7 the second elements comprise ball-pads arranged outside of the cap-zone on the wire-side of  
8 the substrate, and the transmission lines comprise electrically conductive lines; and  
9 the gasket is a thin film disposed on the wire-side of the substrate such that the  
10 thin film surrounds the cap-zone.

1 6. The interconnecting unit of claim 5 wherein the thin film is a pliable  
2 tape applied to the substrate.

1 7. The interconnecting unit of claim 5 wherein the thin film is a polymeric  
2 film deposited on the substrate.

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1 8. The interconnecting unit of claim 1 wherein:  
2 the substrate has a slot, a die-side to which the die is to be attached, and a wire-  
3 side opposite the die-side;  
4 the first elements of the interconnects comprise a plurality of contact elements  
5 being arranged in a contact array adjacent to the slot on the wire-side of the substrate such  
6 that the cap-zone includes a first cap region surrounding the contact array and the slot on the  
7 wire-side of the substrate and a second cap region surrounding an area on the die-side that is  
8 covered by the die when the die is attached to the substrate, the second elements comprise  
9 ball-pads arranged outside of the first cap region on the wire-side of the substrate, and the  
10 transmission lines comprise electrically conductive lines; and  
11 the gasket comprises a first thin film disposed on the die-side of the substrate  
12 surrounding the first cap region and a second thin film disposed on the wire-side of the  
13 substrate surrounding the second cap region.

1 9. The interconnecting unit of claim 8 wherein the first and second thin  
2 films are pliable tape sections.

1 10. The interconnecting unit of claim 8 wherein the first and second thin  
2 films are polymeric films.

1 11. The interconnecting unit of claim 1 wherein the gasket is a piece of tape  
2 adhered to the substrate, the tape having an opening with edges bordering the cap-zone.

1 12. The interconnecting unit of claim 1 wherein the gasket is a compressible  
2 film material adhered to the substrate, the film having an opening with edges bordering the  
3 cap-zone.

1 13. A interconnecting unit for electrically coupling a microelectronic die  
2 having an integrated circuit to voltage sources and signal sources, the interconnecting unit  
3 comprising:

4 a substrate having a cap-zone defined by an area that is to be encapsulated by a  
5 protective casing, a plurality of contact elements arranged in the cap-zone, a plurality of ball-  
6 pads arranged in a ball-pad array outside of the cap-zone, and a plurality of conductive lines  
7 coupling the contact elements to the ball-pads; and

8 a barrier projecting away from a surface of the substrate outside of the cap-  
9 zone, wherein at least a portion of the barrier is adjacent to the cap-zone.

1 14. The interconnecting unit of claim 13 wherein the barrier comprises a  
2 film having an opening with edges bordering the cap-zone.

1 15. The interconnecting unit of claim 14 wherein the film is a thin tape  
2 applied to the substrate.

1 16. The interconnecting unit of claim 14 wherein the film is polymeric  
2 coating applied to the substrate.

1 17. The interconnecting unit of claim 13 wherein the barrier is a ridge  
2 formed in the substrate that surrounds the cap-zone.

1 18. The interconnecting unit of claim 13 wherein:  
2 the substrate has a slot, a die-side to which the die is to be attached, and a wire-  
3 side opposite the die-side, wherein the contact elements are arranged in a contact array  
4 adjacent to an edge of the slot on the wire-side of the substrate, wherein the ball-pad array is  
5 spaced apart from the contact array on the wire-side of the substrate, and a boundary of the  
6 cap-zone is between the contact array and the ball-pad array on the wire-side of the substrate;  
7 and  
8 the barrier comprises a film having an opening with edges bordering the  
9 boundary of the cap-zone.

1 19. The interconnecting unit of claim 18 wherein the film is a thin tape  
2 applied to the substrate.

1 20. The interconnecting unit of claim 18 wherein the film is polymeric  
2 coating applied to the substrate.

1 21. A interconnecting unit for electrically coupling a microelectronic die  
2 having an integrated circuit to voltage sources and signal sources, the interconnecting unit  
3 comprising:

4 a substrate having a cap-zone defined by an area that is to be encapsulated by a  
5 protective casing, an opening in the cap-zone, a plurality of contact elements arranged in the  
6 cap-zone along an edge of the opening, a plurality of ball-pads arranged in a ball-pad array  
7 outside of the cap-zone, and a plurality of conductive lines coupling the contact elements to  
8 the ball-pads; and

9 a barrier on the substrate outside of the cap-zone, wherein at least a portion of  
10 the barrier is adjacent to at least a portion of the cap-zone.

1 22. The interconnecting unit of claim 21 wherein the barrier comprises a  
2 film having an opening with edges bordering the cap-zone.

1                   23.    The interconnecting unit of claim 22 wherein the film is a thin tape  
2    applied to the substrate.

1                   24.    The interconnecting unit of claim 22 wherein the film is polymeric  
2    coating applied to the substrate.

1                   25.    The interconnecting unit of claim 21 wherein the barrier is a ridge  
2    formed in the substrate that surrounds the cap-zone.

1                   26.    A interconnecting unit for electrically coupling a microelectronic die  
2    having an integrated circuit to voltage sources and signal sources, the interconnecting unit  
3    comprising:

4                   a substrate having a cap-zone defined by an area that is to be encapsulated by a  
5    protective casing and a plurality of conductive features configured to be coupled to bond-  
6    pads on the die and electrical circuitry coupled to the voltage sources and the signal sources;  
7    and

8                   a seal on at least one side of the substrate, the seal being configured to engage a  
9    mold during a molding process for forming the protective casing in a manner that prevents a  
10   molding compound from leaking between the substrate and the mold during the molding  
11   process.

1                   27.    A packaged microelectronic device assembly, comprising:

2                   a microelectronic die having an integrated circuit and a plurality of bond-pads  
3    on an exterior surface, at least a set of the bond-pads being operatively coupled to the  
4    integrated circuit;

5                   a substrate having a cap-zone defined by an area that is to be encapsulated by a  
6    protective casing, a plurality of contact elements arranged in the cap-zone, a plurality of ball-  
7    pads arranged in a ball-pad array outside of the cap-zone, and a plurality of conductive lines  
8    coupling the contact elements to the ball-pads, the microelectronic die being attached to the  
9    substrate, and the contact elements being electrically coupled to corresponding bond-pads;

10 a protective casing covering the cap-zone; and  
11 a gasket attached to the substrate outside of the cap-zone, wherein at least a  
12 portion of the gasket is adjacent to at least a portion of the protective casing.

1 28. The packaged microelectronic device of claim 27 wherein the gasket  
2 comprises a film having an opening with edges bordering the cap-zone.

1 29. The packaged microelectronic device of claim 28 wherein the film is a  
2 thin tape applied to the substrate.

1 30. The packaged microelectronic device of claim 28 wherein the film is  
2 polymeric coating applied to the substrate.

1 31. The packaged microelectronic device of claim 27 wherein the barrier is  
2 a ridge formed in the substrate that surrounds the cap-zone.

1 32. The packaged microelectronic device of claim 27 wherein:  
2 the substrate has a slot, a die-side to which the die is to be attached, and a wire-  
3 side opposite the die-side, wherein the contact elements are arranged in a contact array  
4 adjacent to an edge of the slot on the wire-side of the substrate, wherein the ball-pad array is  
5 spaced apart from the contact array on the wire-side of the substrate, and a boundary of the  
6 cap-zone is between the contact array and the ball-pad array on the wire-side of the substrate;  
7 and

8 the gasket comprises a film having an opening with edges bordering the  
9 boundary of the cap-zone.

1 33. The packaged microelectronic device of claim 32 wherein the film is a  
2 thin tape applied to the substrate.

1 34. The packaged microelectronic device of claim 32 wherein the film is  
2 polymeric coating applied to the substrate.

1 35. A packaged microelectronic device assembly, comprising:  
2 a microelectronic die having an integrated circuit and a plurality of bond-pads  
3 on an exterior surface, at least a set of the bond-pads being operatively coupled to the  
4 integrated circuit;  
5 a substrate having a cap-zone defined by an area that is to be encapsulated by a  
6 protective casing, a plurality of contact elements arranged in the cap-zone, a plurality of ball-  
7 pads arranged in a ball-pad array outside of the cap-zone, and a plurality of conductive lines  
8 coupling the contact elements to the ball-pads, the microelectronic die being attached to the  
9 substrate, and the contact elements being electrically coupled to corresponding bond-pads;  
10 a protective casing covering the cap-zone; and  
11 a barrier projecting away from a surface of the substrate outside of the cap-  
12 zone, wherein at least a portion of the barrier is adjacent to at least a portion of the protective  
13 casing.

1 36. The packaged microelectronic device of claim 35 wherein the barrier  
2 comprises a film having an opening with edges bordering the cap-zone.

1 37. The packaged microelectronic device of claim 36 wherein the film is a  
2 thin tape applied to the substrate.

1 38. The packaged microelectronic device of claim 36 wherein the film is  
2 polymeric coating applied to the substrate.

1 39. The packaged microelectronic device of claim 35 wherein the barrier is  
2 a ridge formed in the substrate that surrounds the cap-zone.

1 40. The packaged microelectronic device of claim 35 wherein:  
2 the substrate has a slot, a die-side to which the die is to be attached, and a wire-  
3 side opposite the die-side, wherein the contact elements are arranged in a contact array  
4 adjacent to an edge of the slot on the wire-side of the substrate, wherein the ball-pad array is

5 spaced apart from the contact array on the wire-side of the substrate, and a boundary of the  
6 cap-zone is between the contact array and the ball-pad array on the wire-side of the substrate;  
7 and  
8 the barrier comprises a film having an opening with edges bordering the  
9 boundary of the cap-zone.

1 41. The packaged microelectronic device of claim 40 wherein the film is a  
2 thin tape applied to the substrate.

1 42. The packaged microelectronic device of claim 40 wherein the film is  
2 polymeric coating applied to the substrate.

1 43. A packaged microelectronic device assembly, comprising:  
2 a microelectronic die having an integrated circuit and a plurality of bond-pads  
3 on an exterior surface, at least a set of the bond-pads being operatively coupled to the  
4 integrated circuit;  
5 a substrate having a cap-zone defined by an area that is to be encapsulated by a  
6 protective casing, an opening in the cap-zone, a plurality of contact elements arranged in the  
7 cap-zone along an edge of the opening, a plurality of ball-pads arranged in a ball-pad array  
8 outside of the cap-zone, and a plurality of conductive lines coupling the contact elements to  
9 the ball-pads, the microelectronic die being attached to the substrate, and the contact  
10 elements being electrically coupled to corresponding bond-pads;  
11 a protective casing covering the cap-zone and filling the opening; and  
12 a barrier on the substrate outside of the cap-zone, wherein at least a portion of  
13 the barrier is adjacent to at least a portion of the protective casing.

1 44. The packaged microelectronic device of claim 43 wherein the barrier  
2 comprises a film having an opening with edges bordering the cap-zone.

1 45. The packaged microelectronic device of claim 44 wherein the film is a  
2 thin tape applied to the substrate.



1           46.    The packaged microelectronic device of claim 44 wherein the film is  
2   polymeric coating applied to the substrate.

1           47.    The packaged microelectronic device of claim 43 wherein the barrier is  
2   a ridge formed in the substrate that surrounds the cap-zone.

1           48.    The packaged microelectronic device of claim 43 wherein:  
2                   the substrate has a slot, a die-side to which the die is to be attached, and a wire-  
3   side opposite the die-side, wherein the contact elements are arranged in a contact array  
4   adjacent to an edge of the slot on the wire-side of the substrate, wherein the ball-pad array is  
5   spaced apart from the contact array on the wire-side of the substrate, and a boundary of the  
6   cap-zone is between the contact array and the ball-pad array on the wire-side of the substrate;  
7   and

8                   the barrier comprises a film having an opening with edges bordering the  
9   boundary of the cap-zone.

1           49.    The packaged microelectronic device of claim 48 wherein the film is a  
2   thin tape applied to the substrate.

1           50.    The packaged microelectronic device of claim 48 wherein the film is  
2   polymeric coating applied to the substrate.

1           51.    A packaged microelectronic device assembly, comprising:  
2                   a microelectronic die having an integrated circuit and a plurality of bond-pads  
3   on an exterior surface, at least a set of the bond-pads being operatively coupled to the  
4   integrated circuit;

5                   a substrate having a cap-zone defined by an area that is to be encapsulated by a  
6   protective casing and a plurality of conductive features, at least one conductive feature  
7   having a contact element coupled to corresponding bond-pad on the die, a ball-pad outside of  
8   the cap-zone, and a conductive trace coupling the contact element to the ball-pad;

9 a protective casing covering the cap-zone; and  
10 a seal on at least one side of the substrate, the seal being configured to inhibit  
11 the protective casing from covering the substrate outside of the cap-zone.

1 52. A method of manufacturing a microelectronic device having a  
2 microelectronic die including an integrated circuit and a plurality of bond-pads coupled to  
3 the integrated circuit, comprising:

4 coupling the die to an interconnecting unit, the interconnecting unit having a  
5 substrate and a plurality of conductive features, the substrate having a first side and a second  
6 side, and at least a set of the conductive features each including a contact element, a  
7 conductive line connected to the contact element, and a ball-pad connected to the conductive  
8 line, the ball-pads being on the first side of the substrate wherein the die is coupled to the  
9 interconnecting unit to electrically couple the bond-pads on the die with corresponding  
10 contact elements on the substrate, and wherein the contact elements define a cap-zone that is  
11 to be encapsulated by a protective casing;

12 encapsulating the die and the contact elements by engaging a first bearing  
13 surface of a first mold unit against the first side of the substrate, engaging a second bearing  
14 surface of a second mold unit against the second side of the substrate, positioning the die in  
15 the second mold unit, and injecting a molding compound into at least the second mold unit;  
16 and

17 inhibiting the molding compound from leaking out of the cap-zone between the  
18 substrate and at least one of the first and second mold units by engaging a seal on the  
19 substrate with the one of the first and second mold units.

1 53. The method of claim 52 wherein:  
2 the seal comprises a thin film having an opening with edges bordering the cap-  
3 zone; and

4 engaging the seal with at least one of the first and second mold units comprises  
5 contacting the one of the first and second mold units with the thin film.

1           54.    The method of claim 52 wherein:  
2           the seal comprises a thin tape having an opening with edges bordering the cap-  
3   zone; and  
4           engaging the seal with at least one of the first and second mold units comprises  
5   contacting the one of the first and second mold units with the thin tape.

1           55.    The method of claim 52 wherein:  
2           the seal comprises a polymeric coating having an opening with edges bordering  
3   the cap-zone; and  
4           engaging the seal with at least one of the first and second mold units comprises  
5   contacting the one of the first and second mold units with the polymeric coating.

1           56.    The method of claim 52 wherein:  
2           the substrate has a die-side to which the die is attached, a wire-side, and a slot  
3   from the die-side to the wire-side, the contact elements being arranged in an array on the  
4   wire-side adjacent to an edge of the slot, the ball-pads being arranged on the wire-side  
5   spaced apart from the contact elements, the cap-zone having a boundary on the wire-side  
6   between the array of contact elements and the array of ball-pads, and the seal being a thin  
7   film applied to the wire-side of the substrate, wherein the thin film has an opening bordering  
8   the cap-zone;

9           encapsulating the die and the contact elements comprises positioning the  
10   contact elements in a first cavity of the first mold unit, positioning the die in a second cavity  
11   of a second mold unit, injecting the molding compound into the second cavity, through a  
12   portion of the substrate, and into the first cavity to form a first protective casing over the  
13   contact elements and a second protective casing over the die; and

14           engaging the seal with at least one of the first and second mold units comprises  
15   contacting the first mold unit with the thin film.

1           57. The method of claim 52 wherein:

2           the substrate has a die-side to which the die is attached, a wire-side, and a slot  
3 from the die-side to the wire-side, the contact elements being arranged in an array on the  
4 wire-side adjacent to an edge of the slot, the ball-pads being arranged on the wire-side  
5 spaced apart from the contact elements, the cap-zone having a boundary on the wire-side  
6 between the array of contact elements and the array of ball-pads, and the seal being a thin  
7 tape applied to the wire-side of the substrate, wherein the thin tape has an opening bordering  
8 the cap-zone;

9           encapsulating the die and the contact elements comprises positioning the  
10 contact elements in a first cavity of the first mold unit, positioning the die in a second cavity  
11 of a second mold unit, injecting the molding compound into the second cavity, through a  
12 portion of the substrate, and into the first cavity to form a first protective casing over the  
13 contact elements and a second protective casing over the die; and

14           engaging the seal with at least one of the first and second mold units comprises  
15 contacting the first mold unit with the thin tape.

1           58. The method of claim 52 wherein:

2           the substrate has a die-side to which the die is attached, a wire-side, and a slot  
3 from the die-side to the wire-side, the contact elements being arranged in an array on the  
4 wire-side adjacent to an edge of the slot, the ball-pads being arranged on the wire-side  
5 spaced apart from the contact elements, the cap-zone having a boundary on the wire-side  
6 between the array of contact elements and the array of ball-pads, and the seal being a  
7 polymeric coating applied to the wire-side of the substrate, wherein the polymeric coating  
8 has an opening bordering the cap-zone;

9           encapsulating the die and the contact elements comprises positioning the  
10 contact elements in a first cavity of the first mold unit, positioning the die in a second cavity  
11 of a second mold unit, injecting the molding compound into the second cavity, through a  
12 portion of the substrate, and into the first cavity to form a first protective casing over the  
13 contact elements and a second protective casing over the die; and

engaging the seal with at least one of the first and second mold units comprises contacting the first mold unit with the polymeric coating.

59. A method of manufacturing a microelectronic device, comprising:  
providing an unpackaged unit having a microelectronic die coupled to an interconnecting unit, the die having an integrated circuit and a plurality of bond-pads coupled to the integrated circuit, and the interconnecting unit having a substrate, a plurality of contact elements, a plurality of conductive lines each connected to a corresponding contact element, and a plurality of ball-pads each connected to a corresponding conductive line, wherein the die is coupled to the interconnecting unit to electrically couple the bond-pads on the die with corresponding contact elements on the substrate, and wherein the contact elements define a cap-zone that is to be encapsulated by a protective casing;

engaging a first bearing surface of a first mold unit against a first side of the substrate;

engaging a second bearing surface of a second mold unit against a second side of the substrate so that the die is received within the second mold unit;

injecting a molding compound into at least the second mold unit; and

sealing the cap-zone to inhibit the molding compound from leaking out of the cap-zone between the substrate and at least one of the first and second mold units by engaging a barrier on the substrate with the one of the first and second mold units.

60. A method of manufacturing an interconnecting unit for electrically coupling a microelectronic die having an integrated circuit to voltage sources and signal sources, the method comprising:

forming a plurality of conductive features on a substrate, the plurality of conductive features having a plurality of contact elements arranged in a cap-zone, a plurality of conductive lines, and a plurality of ball-pads arranged in a ball-pad array outside of the cap-zone, wherein each conductive line extends between a contact element and a corresponding ball-pad, and wherein the cap-zone is configured to be covered by a protective casing; and

10 fabricating a barrier on the substrate outside of the cap-zone so that at least a  
11 portion of the barrier is adjacent to a portion of the cap-zone.

1 61. The method of claim 60 wherein fabricating the barrier comprises  
2 disposing a thin film on the substrate to surround the cap-zone.

1 62. The method of claim 60 wherein fabricating the barrier comprises  
2 cutting an opening in a thin tape having a size configured to border the cap-zone and  
3 applying the tape to the substrate so that the opening surrounds the cap-zone.

1 63. The method of claim 60 wherein fabricating the barrier comprises  
2 coating the substrate with a polymeric material and forming an opening the polymeric  
3 material to border the cap-zone.

1 64. A method of manufacturing an interconnecting unit for electrically  
2 coupling a microelectronic die having an integrated circuit to voltage sources and signal  
3 sources, the method comprising:

4 forming a plurality of conductive features on a substrate, the plurality of  
5 conductive features having a plurality of contact elements arranged in a cap-zone, a plurality  
6 of conductive lines, and a plurality of ball-pads arranged in a ball-pad array outside of the  
7 cap-zone, wherein each conductive line extends between a contact element and a  
8 corresponding ball-pad, and wherein the cap-zone is configured to be covered by a protective  
9 casing; and

10 fabricating a raised seal on the substrate outside of the cap-zone so that at least  
11 a portion of the seal is adjacent to a portion of the cap-zone.